the MIRROR

A Newsletter for the DoD Dental Community

November 1996 issue

TRICARE

The premier issue of *The Mirror* (May 96) introduced the military dental health community to the Defense Dental Standard System (DDSS). That issue focused on the history and functionality of DDSS, information about the Initial Operation Sites (IOSs), and the schedule for deployment of the system. In this, the second issue of *The Mirror*, we'll take an in-depth look at how the system functions, what the future holds for DDSS, and the hardware required to run the system.

— Editors

In This Issue

Integrating COTS and GOTS into DDSS

Developing highly specialized software from start to finish that supports clinical care would be a very expensive and time-consuming process. This approach would not take advantage of currently available commercial and government software products that could help provide support in meeting the needs of the military dental health community. The Defense Dental Standard System (DDSS) is being developed through the integration of these software products, including: commercial off-the-shelf (COTS), which is ready-made software available to consumers commercially; government off-the-shelf (GOTS), which are software packages already available in the government; and custom software. DDSS incorporates COTS and GOTS products that meet DDSS requirements and uses custom development where necessary to meet requirements that cannot be met by standalone COTS or GOTS products. Integrating these pieces into a seamless whole will provide proven functionality quickly and efficiently, at a considerable savings to the government.

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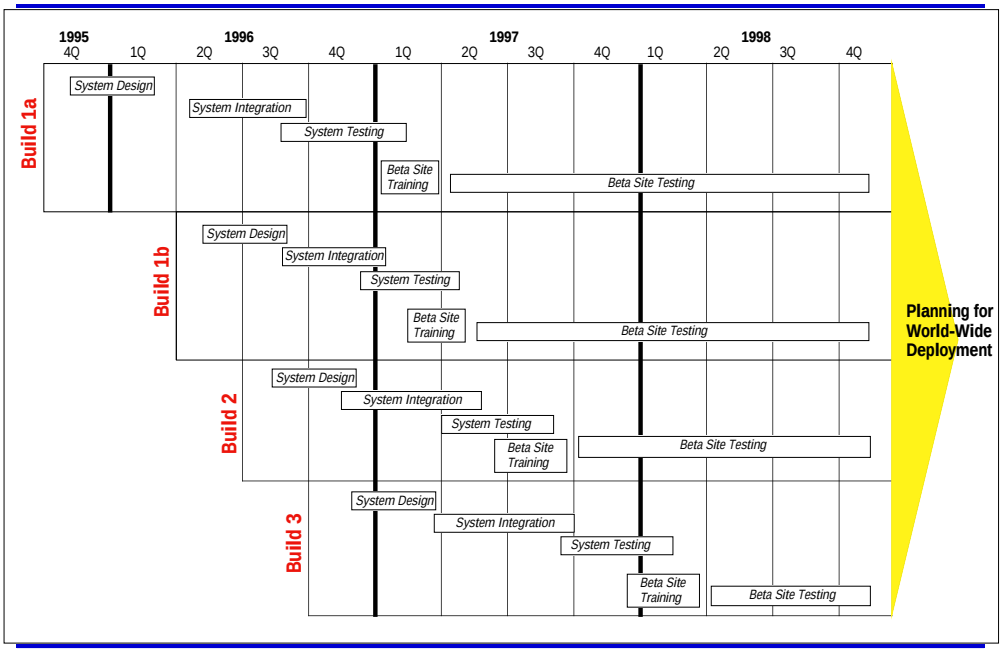

The timeline above illustrates all of the functions of DDSS, from the initial build, scheduled for release to Initial Operation Sites in March 1997, through the final build. Build 1b has been added to provide scheduling capability earlier in the implementation.

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In deliberating on this integration process, the PMO reviewed a variety of COTS and GOTS products to find those most suitable for DDSS. Certain criteria were used to select these products, such as: need for functionality versus cost of custom development, availability and maintainability of product, soundness of the programming code design, ease of integration into DDSS, cost, and ease of use.

Two COTS products were chosen for incorporation into Build 1 of DDSS: a charting package and a scheduling package. During future system builds, additional COTS and GOTS products will be integrated into DDSS to provide key areas of functionality. For example, Build 2 includes Materiel Management functions, which will incorporate the GOTS product known as the Defense Medical Logistics Standard System (DMLSS). Additionally, Build 2 will include the functionality of a COTS product to support Digitized Oral Radiography, the capture of x-rays without the use of film. Build 3 will include COTS products to support real-time tele-consultation and Computer Assisted Case Management. ▲

The DDSS Team

The DDSS Program Management Office staff:

Colonel Charles L. Dyer (Air Force), Program Manager
Commander Thomas A. Lafferty (Navy), Deputy Program Manager
LTC Richard D. Guerin (Army), Health Care Planner
MSgt Duane R. Pouliot (Air Force), Management Specialist
SSG Mark A. Toth (Army), Management Specialist

and new PMO staff members:

Colonel David Chance (Air Force), Deputy Program Manager
MSgt. James Carsten (Air Force), Management Specialist
DT3 Linora Hayes (Navy), Management Specialist

The DDSS Development and Integration Contractor

American Management Systems, Inc.
AMS has formed a partnership with the PMO, working hand-in-hand to help achieve the Strategic Vision through DDSS.

Tri-Dental Health

The New Dental Service Process

The way in which the military dental health community does business is changing. The familiar shuffling of papers which constitutes the current process, will become a thing of the past. DDSS is helping the military dental health community usher in the modern age of dentistry, while reinventing the process through which providers deliver and document care. This issue of *The Mirror* looks at the aforementioned COTS, GOTS, and custom products that make up DDSS and places them in the context of a patient receiving care through the new dental service process.

The patient begins at the dental clinic by self-registering at the patient registration kiosk. Using touch-screen technology (see figure above) the patient verifies his or her service opportunity (or appointment), eligibility status through DEERS, and enters or updates personal health history information, which is stored and maintained in the system. The figure above illustrates the simplicity and ease-of-use of the patient registration function of DDSS.

After registering, the patient is brought into a treatment room for review of their health history information and examination.

DDSS Health History

The provider may view health history prior to seeing the patient, or review health history information during the initial interview with the patient. Comprehensive health history information is available on the Dental History screens, and contains the subjective data gathered from the patient, including the chief complaint, information from previous service opportunities, and the patient's overall medical record information from CHCS. Objective data like vital signs can also be entered and viewed on this window.

DDSS Exams

The Exams portion of DDSS allows providers to enter objective data: findings, and tooth numbers and/or location, if applicable, for each exam performed. The provider selects the type of exam, Head and Neck, Cancer(OCSE), Occlusal, TMJ, or PSR, and the appropriate graphic image appears on the window. All findings associated with that exam appear in a pop-up list box. The provider selects one or more finding and associates a tooth number and/or location with each. Selected items appear in a grid when the list box is closed.

The next portion, called Imaging, allows the provider to view or add images to the patient's record.

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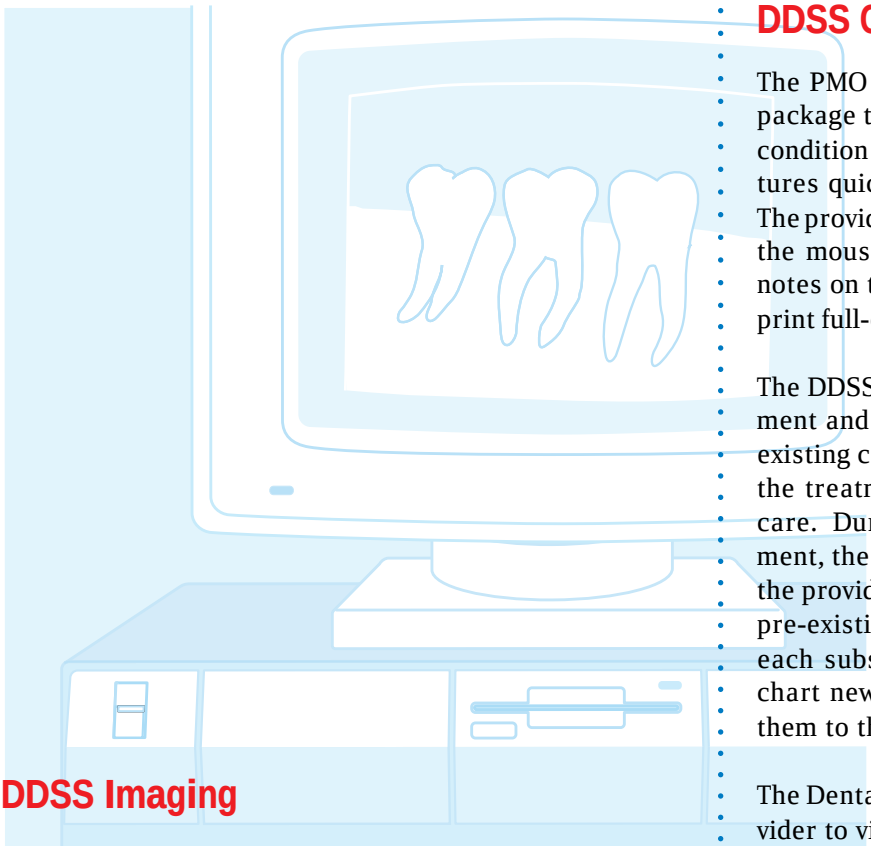


DDSS Imaging

The imaging functions of DDSS allow the provider to create new images and enter the findings associated with each. When a provider chooses an image name from an outlined list on the left of the window, all the findings associated with that image appear in a pop-up list box. The provider then selects one or more finding and associates a tooth number and/or location with each. Selected items appear in a grid when the list box is closed.

The imaging functions of DDSS will be perfomed by a COTS product yet to be determined, and will be available for Build 2.

Digitized radiography eliminates the use, storage and recycling of film and its by-products, such as silver. When worldwide deployment of DDSS is complete, providers will be able to transmit to and receive images from military dental clinics anywhere in the world, real-time. Look for information about DDSS imaging and global communication in the next issue of *The Mirror.*

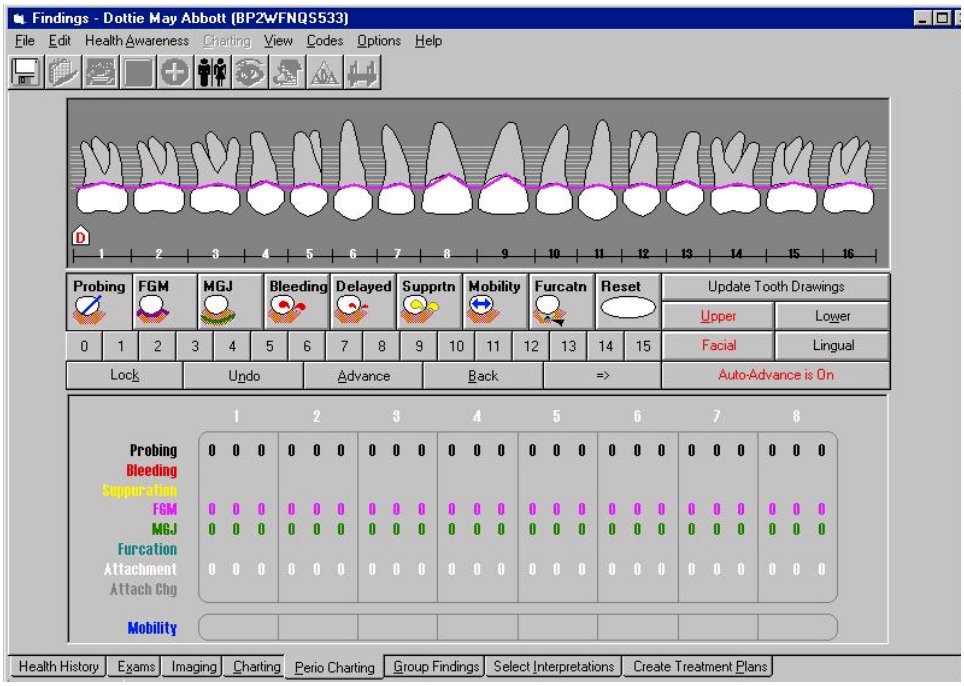
Still more objective data can be entered onto the patient's record using the DDSS Charting function.

DDSS Charting

The PMO has selected a Windows-based COTS software package that allows the dental care provider to chart the condition of a patient's dentition and supporting structures quickly and easily using a graphic representation. The provider can perform most charting functions by using the mouse, and the keyboard can be used for entering notes on the patient record. The provider will be able to print full-color dental restorative and periodontal charts.

The DDSS Charting function provides the ability to document and display a variety of information, including pre-existing conditions, treatment provided at each visit, and the treatment plan for both restorative and periodontal care. During the initial Service Opportunity, or appointment, the patient's oral health status is first charted, and the provider uses the DDSS Charting function to record a pre-existing record that is the baseline for the patient. At each subsequent Service Opportunity, the provider can chart new conditions and treatment plans and compare them to the pre-existing chart.

The Dental Charting functions of DDSS will allow the provider to view both maxillary and mandibular arches, and select a charting condition. All charting conditions are color-coded for easy identification. The figure below illustrates the periodontal view of the patient's mouth, the buttons available for selecting conditions, and the list of selected conditions or operations performed to date. Charting will also utilize DoD symbols and notations to make conditions easily recognizable and usable to DDSS users.



DDSS Charting

Charting is an easy process. To chart examination findings, the provider clicks the appropriate attribute (or condition) button and then clicks on the graphic representation of the tooth or surface area that has the condition. The description, tooth number, provider, and date completed are automatically entered in the list of findings at the bottom of the window. Nearly 40 conditions are available, including:

- Chipped Tooth
- Cracked Tooth
- Missing Tooth
- Impacted Tooth
- Under Contoured
- Eruption
- Rotation
- Caries
- Post Implant
- Reset (undo condition)
- Root Lesion
- Overhang
- Drifting

Periodontal charting allows the provider to view teeth and gingiva from the maxillary, mandibular, facial, and lingual views, and select an appropriate charting condition. Just as in restorative charting, periodontal charting conditions are color-coded for easy identification. An automatic advance feature allows the provider to chart measurements for pocket depth, Free Gingival Margin, and Mucogingival Junction; and move automatically to the next coordinate available for charting. The provider can also chart bleeding, delayed bleeding, mobility, suppuration, and furcations.

After the patient's mouth has been charted in DDSS, the provider develops a treatment plan.

Developing a Treatment Plan

After charting the patient's mouth, the provider can begin to develop a treatment plan. Developing a Treatment Plan consists of assessment and planning. Assessment contains: grouping findings, selecting and modifying primary interpretations, selecting and modifying interventions. Planning contains: developing treatment lists, recommending a treatment plan, and recording a patient's consent or refusal of treatment.

It is important to note here that DDSS offers providers a helping hand with consistency of data and completeness of the dental care process, it does not preclude the provider from the thought process involved in interpreting findings or developing treatment plans. DDSS supplies providers with lists of interpretations associated with given findings, so that the provider may work more quickly and efficiently, selecting from lists rather than creating from scratch.

Once a treatment plan has been selected and the patient has consented to it, the provider allocates resources for the patient's future Service Opportunities.

Scheduling Within DDSS — Point of Service Resource Allocation

To fulfill the Scheduling functionality required in Build 1 of DDSS, a Windows-based software package was selected. This package uses common graphical user interface functions. This makes scheduling easy to learn and easy to use. DDSS Scheduling will minimize patient wait times, maximize patient turnaround, optimize resource utilization, and improve patient scheduling.

DDSS Scheduling utilizes pull-down menus and toolbar buttons, which make executing a command as easy as clicking a mouse button. Toolbar buttons enable the user to schedule, manage, and cancel service opportunities; save completed service opportunities; change the scheduling time frame from minutes to hours to days and back again quickly; and perform a variety of other tasks. A graphical calendar makes changing the scheduling time frame easy and intuitive. The DDSS Scheduling graphic on the next page illustrates this.

In the Build 2 portion of Scheduling, users can allocate rooms, equipment, and staff. A grid resembling a spreadsheet displays resources and time slots. A color-coded status bar changes color to distinguish various resource situations in adjacent time slots such as availability, lack of availability, on-call status, and pre-allocation. For instance, the color red warns the user that resources are conflicting or overbooked.

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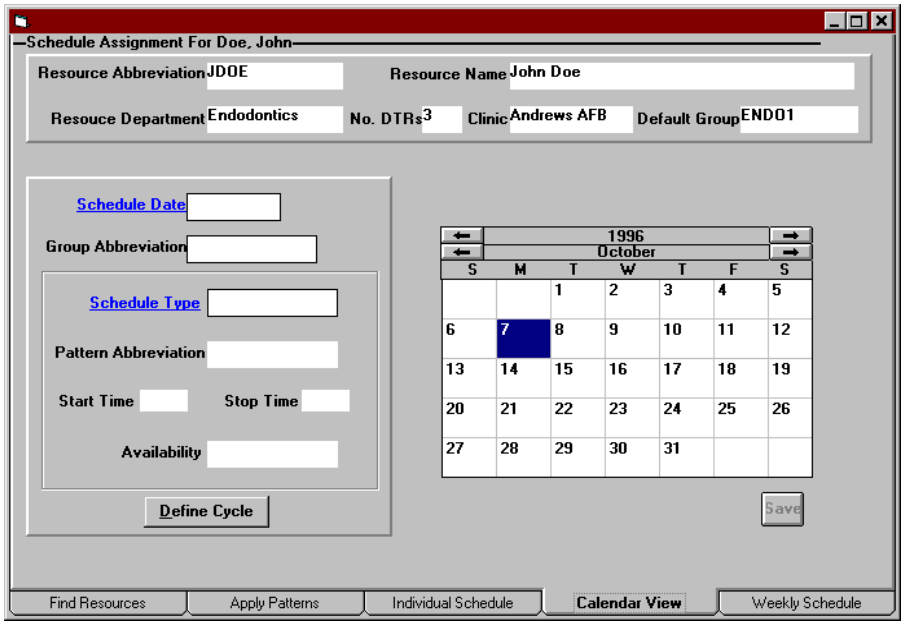
Business and clinical rules are used and adapted to the specific needs of both the military dental health community and individual clinics. These rules keep track of all scheduling restrictions, dependencies, and other complexities, so that providers and other users can work within the framework of these rules.



DDSS Scheduling

Since resources determine the quantity and types of provider services, scheduling optimizes resource utilization to help clinics deliver higher levels of service while maintaining control over costs. Users can define all clinic resources: *rooms* (including name, location, and availability), *equipment* (including, x-ray machines, and other hardware), and *staff* (including demographics, education, privileges, and credentials).

Realizing when these resources are available is as important as knowing what the resources are. The Resource Management feature of Scheduling enables users to create and print availability schedules for every "Who, What, When, and Where" in the clinic. Resource Management reports can list any configuration of provider and patient schedules and allocations, as well as vacation time, holidays, room restrictions, equipment downtime, facility maintenance, repair, and renovation. DDSS Scheduling is a powerful tool that helps users control all resource allocation. ▲

DDSS Community Reviews

The Tri-Service Dental Community in the National Capital Region is actively involved in testing and verifying the functional capability of DDSS. This expert panel of military dentists, dental assistants, and technicians is working closely with the contractor (American Management Systems) and the PMO to ensure that this new system is compatible with the current practices and future needs of military dentistry.

The group is composed of Dental Officers and assistants from each Service. They participate in the functional design analysis and the end-user review process.

This group of functional experts periodically comes together at the AMS Center for Advanced Technologies, located in Northern Virginia, to examine screen designs, evaluate usability, and give feedback on the development efforts of the DDSS software. These periodic reviews give them the opportunity to propose changes, recommendations, and improvements to DDSS. The feedback received from this group has already brought about numerous changes and is expected to contribute to many more. ▲

DDSS Hardware

DDSS will be deployed in a client/server configuration. The primary components of the client/server configuration are workstations, which are the primary means of interacting with DDSS, and servers connected through a local area network (LAN). The configuration of hardware components is dependent on the size of the Dental Treatment Facility (DTF).

- High Capacity Configuration - A facility-based DTF with more than 30 Dental Treatment Rooms (DTRs).
- Medium Capacity Configuration - A facility-based DTF with 11-30 DTRs.
- Small Capacity Configuration - A facility-based DTF with 1-10 DTRs, or an Area Dental Laboratory (ADL) located in a separate facility.
- Remote/Field Configuration - A DTF that is not operating in a fixed facility-based environment with 1-10 DTRs.

DDSS Hardware Requirements

The Initial Operation Sites (IOSs) can expect to receive the following equipment for implementation of DDSS. The specifications listed are minimum requirements.

Workstations: Worstations will come pre-configured to operate DDSS and some office automation functions. The office automation functions will include word processing spreadsheets, and presentations. Each DTR, designated laboratory area, and x-ray area will have a complete workstation that includes items in the table below.

COMPONENT	SPECIFICATION
Processor	Pentium-based 133 MHz or above.
Disk Drives	Variable
Diskette Drive	1.44 MB/3.5-inch
CD-ROM Drive	4X
Memory	32 - 48 MB
Card Reader	16-Bit PC Card or 32-Bit Card Bus
Monitor	17" SVGA, 800x600 screen resolution
Keyboard	Variable
Mouse	Variable
Network Interface Card	Ethernet or Token Ring Network Cards

Patient Registration Terminals: The clinic reception areas will contain patient registration terminals, or kiosks. These are terminals that operate by touch screen, or another easy-to-use input technology, and are very similar to the workstations, except that they have special monitors they require less memory. These terminals will be arranged in a way that protects the privacy of the patient while information is being entered.

Servers: Servers are similar to the workstations and patient registration terminals, with a few key exceptions: the Pentium-based processors will include SMP boards, and the machines will be equipped with 512 K of cache and 64-128 MB of memory.

The clinic workstations and patient registration terminals will be connected by a LAN to one or more servers. The number of servers will depend on the capacity of the DTF. The DDSS servers will support one or more of the following services: database, application, external interface, file and printer, distribution, and system management. In some cases, a single server may support multiple services. The performance and capacity requirements of a DDSS site will determine how these services are bundled and deployed among the server platforms available at that site.

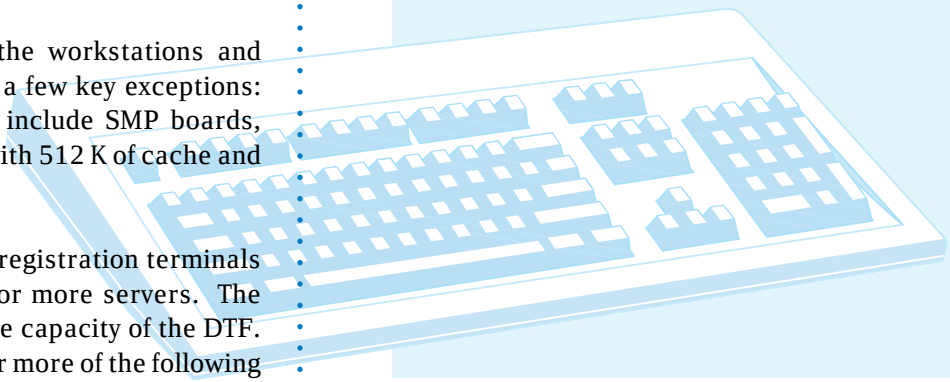
Printers: Printers are needed to support the requirement for paper output of reports, patient records, including charts and images. Printers must be LAN-ready. Each facility will have color printing capability.

Hubs: Hubs provide 10Base-T connectivity for supporting 10 Mbps, Ethernet over fiber optic cable or unshielded twisted pair (UTP) cabling for servers, workstations, patient registration terminals, and printers.

Security Considerations

DDSS is designed as a C2 Level Trusted system. Although DDSS will not process any classified information, the dental information processed is considered sensitive under the Privacy Act. This requires that access to DDSS information be controlled. All users must be identified by an ID and authenticated by a password. In addition, the location of all DDSS hardware must be controlled.

Contact the PMO for further information about hardware or security issues. ▲



DTR Readiness Testing

On Wednesday, October 23, 1996, several dentists and dental assistants from the military dental community had an opportunity to test the usability of DDSS. In a usability laboratory designed by the contractor, a "mock up" DTR with accurate spatial dimensions was created. This DTR included an actual dental chair with accessories, provider seating, DDSS installation, and realistic amounts of counter space. Four teams, each consisting of a dentist and a dental assistant, spent two hours apiece performing realistic dental appointment scenarios. These real-life scenarios were videotaped so that DDSS designers and developers can study the practical usability of the system and make modifications and improvements wherever necessary prior to delivery of Build 1.

After each team participated in the DTR session, they completed a questionnaire identifying features they liked and disliked. They were also interviewed by members of the DDSS Testing Team to discuss functional and cosmetic issues that would improve the system, make it more intuitive, and provide proper service to the end-user. The information collected from this test will prove to be invaluable as AMS continues to improve the quality of their software design. ▲

DDSS and DoD Standards

Like Composite Health Care System II (CHCS II), DDSS is a component of the Military Health Services System (MHSS) and is designed to meet all requirements necessary to interface with other DoD systems. As such, the development of DDSS is guided by many commercial and DoD standards, like the Joint Technical Architecture (JTA) and the Common Operating Environment (COE). The JTA sets minimum standards for DoD Information Technology (IT) systems, and specifically mandates the use of COE.

The "Emerald City" is the MHSS driving vision for healthcare processes in the 21st century. The COE that underlies the Emerald City provides for standards and techniques that allow for a large application to be built from smaller components. Such is the case with DDSS. As DDSS is deployed, it will operate as an internal component of the Emerald City and will draw upon and contribute to other clinical systems, such as CHCS. It will also provide the capability to interface with non-clinical systems within the MHSS.

Dental activity commanders should not envision DDSS as an alternative to CHCS, and they should not feel like they are in a situation of having to decide between using DDSS and CHCS. DDSS is each dental activity's "window" to CHCS and other MHSS systems.

DDSS Operating System

Health Affairs has recently designated Windows NT as the operating system platform of choice for MHSS applications, for both workstations and servers. DDSS runs on Windows NT workstations, and will make use of Windows NT-based servers for database and application servers. DDSS builds on and integrates a number of COTS packages in a scaleable structure based on industry standards to deliver dental-specific functionality. ▲